

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

AMENDMENTS TO THE CLAIMS:

1. (Currently amended) A test circuit for a logical integrated circuit having an input terminal, a first-functional output terminal, and a scan output terminal, said test circuit comprising:

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series,

a like plurality of logic gates, each logic gate having an output terminal connected to an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops through the respective logic gates, to propagate a test pattern applied to the input terminal of one of said plurality of serially connected flip-flops, wherein:

the test pattern measures so as to measure an alternating current characteristic of the input terminal or the first-functional output terminal of said logical integrated circuit, and

wherein said scan path connects the output terminal of the flip-flop located at an end of the first stage with the scan output terminal of said logical integrated circuit.

2. (Currently amended) A test circuit for a logical integrated circuit having a first-functional input terminal, an output terminal, and a scan input terminal, said test circuit comprising:

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series,

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

a like plurality of logic gates, each logic gate having an output terminal connected to an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops through the respective logic gates, to propagate a test pattern applied to the input terminal of one of said plurality of serially connected flip-flops, wherein:

the test pattern measures so as to measure an alternating current characteristic of the first-functional input terminal or the output terminal of said logical integrated circuit, and

~~wherein~~ said scan path connects the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the nth stage.

3. (Currently amended) A test circuit for a logical integrated circuit having an input terminal, a first-functional output terminal, and a scan output terminal, said test circuit comprising:

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series,

a like plurality of logic gates, each logic gate having an output terminal connected to an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops through the respective logic gates, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, wherein:

the test pattern measures so as to measure an alternating current characteristic of the input terminal or the first-functional output terminal of said logical integrated circuit,

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

wherein:

said scan path connects the scan input with the input terminal of the flip-flop located at the head of the nth stage,

from the output of the flip-flop located at the end of the nth stage, said scan path further connects the flip-flops in the second to the (n-1)th stages in series,

said scan path then connects the output terminal of the flip-flop located at the end of the (n-1)th stage with the input terminal of the flip-flop located at the head of the first stage, and

the scan path finally connects the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit.

4. (Currently amended) A method of testing a logical integrated circuit, the logical integrated circuit comprising:

an input terminal,

a first functional output terminal,

a scan output terminal,

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series,

a like plurality of logic gates, each logic gate having an output terminal connected to an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops through the respective logic gates, to propagate a test pattern applied to the input of one

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

of said plurality of serially connected flip-flops, ~~so as to measure the test pattern measuring an~~
alternating current characteristic of the input terminal or the first functional output terminal
of said logical integrated circuit, said method comprising:

connecting the output terminal of the flip-flop located at the end of the first stage with
the scan output terminal of said logical integrated circuit,

inputting a clock signal to a clock signal input terminal of each of said flip-flops,

inputting a predetermined data signal to the input terminal of said logical integrated
circuit, and

measuring the alternating current characteristic of the input terminal of said logical
integrated circuit by inspecting the output of the scan output terminal of said logical
integrated circuit.

5. (Currently amended) A method of testing a logical integrated circuit, the logical
integrated circuit comprising:

a first functional input terminal,

an output terminal,

a scan input terminal,

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal,
said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops
connected in series,

a like plurality of logic gates, each logic gate having an output terminal connected to
an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

flops through the respective logic gates, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, ~~so as to measure the test pattern measuring an~~ alternating current characteristic of the ~~first functional~~ input terminal or the output terminal of said logical integrated circuit, said method comprising:

connecting the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the nth stage,

inputting a clock signal to a clock signal input terminal of each of said flip-flops,

inputting a predetermined data signal to the scan input terminal of said logical integrated circuit, and

measuring the alternating current characteristic of the output terminal of said logical integrated circuit by inspecting the output of the output terminal of said logical integrated circuit.

6. (Currently amended) A method of testing a logical integrated circuit, the logical integrated circuit comprising:

a ~~first functional~~ input terminal

a ~~first functional~~ output terminal,

a scan input terminal,

a scan output terminal,

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series,

a like plurality of logic gates, each logic gate having an output terminal connected to

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops through the respective logic gates, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, ~~so as to measure the test pattern measuring an~~ alternating current characteristic of the first functional input terminal or the first functional output terminal of said logical integrated circuit, said method comprising:

connecting the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the nth stage,

connecting the output terminal of the flip-flop located at the end of the nth stage with the input terminal of the flip-flop located at the head of the second stage,

connecting the flip-flops in the second to the (n-1)th stages in series,

connecting the output terminal of the flip-flop located at the end of the (n-1)th stage with the input terminal of the flip-flop located at the head of the first stage,

connecting the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit,

inputting a clock signal to a clock signal input terminal of each of said flip-flops,

inputting a scan input signal to the scan input terminal of said logical integrated circuit,

inputting a predetermined data signal to the first functional input terminal of said logical integrated circuit, and

measuring the alternating current characteristic of the first functional input terminal of said logical integrated circuit by inspecting an output of the scan output terminal of said logical integrated circuit.

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

7. (Currently amended) A method of testing a logical integrated circuit, the logical integrated circuit comprising:

- a first-functional input terminal
- a first-functional output terminal,
- a scan input terminal,
- a scan output terminal,
- a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series,
- a like plurality of logic gates, each logic gate having an output terminal connected to an input terminal of a respective one of said plurality of flip-flops, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops through the respective logic gates, to propagate a test pattern applied to the input of one of said plurality of flip-flops, ~~so as to measure the test pattern measuring an~~ alternating current characteristic of the first-functional input terminal or the first-functional output terminal of said logical integrated circuit, said method comprising:

- connecting the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the n th stage,
- connecting the output terminal of the flip-flop located at the end of the n th stage with the input terminal of the flip-flop located at the head of the second stage,
- connecting the flip-flops in the second to the $(n-1)$ th stages in series,
- connecting the output terminal of the flip-flop located at the end of the $(n-1)$ th stage

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

with the input terminal of the flip-flop located at the head of the first stage,

connecting the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit,

inputting a clock signal to a clock signal input terminal of each of said flip-flops,

inputting a predetermined data signal to the scan input terminal of said logical integrated circuit, and

measuring the alternating current characteristic of the ~~first-functional~~ output terminal of said logical integrated circuit by inspecting the output of the output terminal of said logical integrated circuit.

8. (Currently amended) A test circuit for a logical integrated circuit having an input terminal, a ~~first-functional~~ output terminal, and a scan output terminal, said test circuit comprising:

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops, to propagate a test pattern applied to the input terminal of one of said plurality of serially connected flip-flops, wherein:

the test pattern measures so as to measure an alternating current characteristic of the input terminal or the ~~first-functional~~ output terminal of said logical integrated circuit, and

~~wherein~~ said scan path connects the output terminal of the flip-flop located at an end of the first stage with the scan output terminal of said logical integrated circuit.

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

9. (Currently amended) A test circuit for a logical integrated circuit having a ~~first~~ functional input terminal, an output terminal, and a scan input terminal, said test circuit comprising:

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops, to propagate a test pattern applied to the input terminal of one of said plurality of serially connected flip-flops, wherein:

the test pattern measures so as to measure an alternating current characteristic of the ~~first~~ functional input terminal or the output terminal of said logical integrated circuit, and

~~wherein~~ said scan path connects the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the nth stage.

10. (Currently amended) A test circuit for a logical integrated circuit having an input terminal, a ~~first~~ functional output terminal, and a scan output terminal, said test circuit comprising:

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

flops, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, wherein:

the test pattern measures ~~so as to measure~~ an alternating current characteristic of the input terminal or the ~~first functional~~ output terminal of said logical integrated circuit, wherein:

said scan path connects the scan input with the input terminal of the flip-flop located at the head of the nth stage,

from the output of the flip-flop located at the end of the nth stage, said scan path further connects the flip-flops in the second to the (n-1)th stages in series,

said scan path then connects the output terminal of the flip-flop located at the end of the

(n-1)th stage with the input terminal of the flip-flop located at the head of the first stage, and

the scan path finally connects the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit.

11. (Currently amended) A method of testing a logical integrated circuit, the logical integrated circuit comprising:

an input terminal,

a ~~first functional~~ output terminal,

a scan output terminal,

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, ~~so as to measure the test pattern measuring~~ an alternating current characteristic of the input terminal or the ~~first functional~~ output terminal of said logical integrated circuit, said method comprising:

connecting the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit,

inputting a clock signal to a clock signal input terminal of each of said flip-flops,

inputting a predetermined data signal to the input terminal of said logical integrated circuit, and

measuring the alternating current characteristic of the input terminal of said logical integrated circuit by inspecting the output of the scan output terminal of said logical integrated circuit.

12. (Currently amended) A method of testing a logical integrated circuit, the logical integrated circuit comprising:

a ~~first functional~~ input terminal,

an output terminal,

a scan input terminal,

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

flops, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, ~~so as to measure the test pattern measuring an~~ alternating current characteristic of the ~~first-functional~~ input terminal or the output terminal of said logical integrated circuit, said method comprising:

connecting the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the nth stage,

inputting a clock signal to a clock signal input terminal of each of said flip-flops,

inputting a predetermined data signal to the scan input terminal of said logical integrated circuit, and

measuring the alternating current characteristic of the output terminal of said logical integrated circuit by inspecting the output of the output terminal of said logical integrated circuit.

13. (Currently amended) A method of testing a logical integrated circuit, the logical integrated circuit comprising:

a ~~first-functional~~ input terminal

a ~~first-functional~~ output terminal,

a scan input terminal,

a scan output terminal,

a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

flops, to propagate a test pattern applied to the input of one of said plurality of serially connected flip-flops, ~~so as to measure the test pattern measuring an~~ alternating current characteristic of the ~~first functional~~ input terminal or the ~~first functional~~ output terminal of said logical integrated circuit, said method comprising:

- connecting the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the nth stage,
- connecting the output terminal of the flip-flop located at the end of the nth stage with the input terminal of the flip-flop located at the head of the second stage,
- connecting the flip-flops in the second to the (n-1)th stages in series,
- connecting the output terminal of the flip-flop located at the end of the (n-1)th stage with the input terminal of the flip-flop located at the head of the first stage,
- connecting the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit,
- inputting a clock signal to a clock signal input terminal of each of said flip-flops,
- inputting a scan input signal to the scan input terminal of said logical integrated circuit,
- inputting a predetermined data signal to the ~~first functional~~ input terminal of said logical integrated circuit, and
- measuring the alternating current characteristic of the ~~first functional~~ input terminal of said logical integrated circuit by inspecting an output of the scan output terminal of said logical integrated circuit.

14. (Currently amended) A method of testing a logical integrated circuit, the logical

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

integrated circuit comprising:

- a first-functional input terminal
- a first-functional output terminal,
- a scan input terminal,
- a scan output terminal,
- a plurality of flip-flops, each flip-flop having an input terminal and an output terminal, said flip-flops being arranged in a matrix having n stages, each stage comprising m flip-flops connected in series, and

means forming a scan path serially connecting ~~at least some of~~ said plurality of flip-flops, to propagate a test pattern applied to the input of one of said plurality of flip-flops, ~~so as to measure the test pattern measuring an~~ alternating current characteristic of the first-functional input terminal or the first-functional output terminal of said logical integrated circuit, said method comprising:

- connecting the scan input terminal of said logical integrated circuit with the input terminal of the flip-flop located at the head of the n th stage,

- connecting the output terminal of the flip-flop located at the end of the n th stage with the input terminal of the flip-flop located at the head of the second stage,

- connecting the flip-flops in the second to the $(n-1)$ th stages in series,

- connecting the output terminal of the flip-flop located at the end of the $(n-1)$ th stage with the input terminal of the flip-flop located at the head of the first stage,

- connecting the output terminal of the flip-flop located at the end of the first stage with the scan output terminal of said logical integrated circuit,

- inputting a clock signal to a clock signal input terminal of each of said flip-flops,

Serial No. 10/026,532
Docket No. PNDF-01197
HIR.046

inputting a predetermined data signal to the scan input terminal of said logical integrated circuit, and

measuring the alternating current characteristic of the first-functional output terminal of said logical integrated circuit by inspecting the output of the output terminal of said logical integrated circuit.